CURRICULUM VITAE

Zeynab (Maral) Maghsoudi

PhD,
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PROFILE SUMMARY

I am a machine learning and bioinformatics researcher developing scalable, reproducible methods for analyzing high-dimensional biological data. My work focuses on multi-omics integration, pathway analysis, and predictive modeling using advanced ML/DL frameworks, with applications in cancer, neurodegenerative disease, and spaceflight biology. I contribute to open-source computational tools and peer-reviewed methods, and I am increasingly exploring AI agents to support automated data integration and analysis. I am particularly interested in individualized and interpretable models that enable system-level insights from complex biomedical data. My goal is to advance precision medicine and systems biology by bridging computer science and biology.

EDUCATION

Ph.D. in Computer Science and Engineering, **University of Nevada, Reno** (Feb 2021– Current)

Research: Exploration of Single/Multi-Omics Data Integration for Systems-Level Understanding.

M.Sc. in Software Engineering, **IUST** (Sep 2014 – Apr 2017)

Research: A New Approach to Malware Detection and Classification based on the Combination of Static Structure and Dynamic Behavior.

B.Sc. in Software Engineering, **University of Arak** (Jan 2009 – Feb 2013)

Project: Investigating of Attacks in Computer Networks.

RESEARCH INTERESTS

- AI for Multi-Omics and Data Integration
- Patient-Level Modeling and Pathway Scoring
- Explainable AI in Systems Biology
- AI Applications in Cancer and Spaceflight Biology
- Developing AI Agents for Scientific Discovery
- Scalable and Reproducible Computational Frameworks

JOURNAL PUBLICATIONS

- **[Co-first author]** Guarnieri JW, **Maghsoudi Z**, Kim J, Bya P, Widjaja GA, Barker R, Burke M, Cen Z, Fazelinia H, Tsoy S, Tiersky R. Guardians of the Mitochondria: Space Mitochondria 2.0 Systemic Analysis Reveals Bioenergetic Dysregulation Across Species. **Cell**. 2025. (Under second revision; **IF: 46.0**)
- **Maghsoudi Z**, Nguyen H, Tavakkoli A, Nguyen T. A comprehensive survey of the approaches for pathway analysis using multi-omics data integration. **Briefings in Bioinformatics**. 2022 Nov;23(6):bbac435. (**IF: 14.0**)
- **Maghsoudi Z**, Reisi-Dehkordi A, Harris Jr FC. Text Mining Landscape in Bioinformatics: An In-Depth Analysis of Tasks and Techniques. **Data Intelligence**. 2025. (Under second revision; **IF: 3.9**)
- **Maghsoudi Z**, Harris Jr FC. PathEncoder: An Autoencoder-Based Framework for Individualized Multi-Omics Pathway Deregulation Scoring. **BMC Bioinformatics**. 2025. (Under review; **IF: 3.5**)
- Nguyen H, Nguyen H, **Maghsoudi Z**, Tran B, Draghici S, Nguyen T. RCPA: An Open-Source R Package for Data Processing, Differential Analysis, Consensus Pathway Analysis, and Visualization. **Current protocols**. 2024 May;4(5):e1036. (**IF: 2.2**)

CONFERENCES & PRESENTATIONS

- **Maghsoudi Z**, Harris Jr FC. PathLit-Agent: A Multi-Stage AI Literature Mining System for Pathway-Focused Biomedical Insight. In: Proceedings of the International Conference on Information Technology – New Generations. (Accepted, Under Publication)
- **Maghsoudi Z**, Harris Jr FC. A Patient-Specific Multi-omics Pathway Analysis Method Using Hierarchical NNMF for Improved Gene Weighting. In: Proceedings of the International Conference on Information Technology – New Generations (ITNG 2025), Apr 27, Las Vegas, NV. Published in **Springer Lecture Notes in Networks and Systems**, pp. 727–736.
- **Maghsoudi Z.** Text Mining Framework for Predicting Tick-Borne Disease Patterns and Dynamics. Poster presented at the **RII Track-2 FEC Project Meeting**, Vermont, 2023.

WORKING EXPERIENCE

Data Scientist & Bioinformatics Research Assistant, **University of Nevada, Reno**. (Feb 2021 – Current)

- Developed PathLit-Agent, an AI-driven literature-mining system that automates PubMed retrieval and produces concise, structured markdown summaries—significantly reducing manual review time and accelerating pathway-focused insight generation.
- Developed deep learning models (ResNet50, VGG-16) with advanced feature engineering (BEMD) for MRI-based breast mass classification, boosting diagnostic accuracy.
- Designed a personalized pathway analysis framework using sequential NMF for gene weighting for three omics (mRNA, methylation, CNV), improving tumor detection in TCGA data by up to 5%.
- Developed an autoencoder-based framework for individual-level pathway analysis in multi-omics data, improving aberrant sample detection accuracy in TCGA datasets.
- Co-led development of the RCPA R package, enabling reproducible large-scale pathway analysis workflows (1,000+ species) with integrated statistical methods.
- Led pathway meta-analysis with NASA GeneLab, revealing mitochondrial dysfunction signatures across spaceflight datasets.
- Built an NGS variant calling pipeline for SARS-CoV-2 at Renown Hospital, ensuring accurate genomic mutation detection.

C++ Developer | R&D Team Member, AmnPardaz. (Jan 2019 – Mar 2019)

- Researched/evaluated antivirus solutions and developed reliable C++ modules for security tools.

C# Developer, Representative of LG Company. (Jan 2018 – Jan 2019)

- Designed and deployed automated inventory and sales systems for workflow optimization.

Malware Analysis Researcher, IUST. (Sep 2015 – Apr 2017)

- Built a machine learning–based malware detection pipeline integrating static code analysis (control-flow features) and dynamic behavioral profiling (system calls).
- Applied supervised ML models to extracted features, improving malware detection accuracy by 7% with anti-analysis–aware techniques.

TEACHING and MENTORING

Graduate Teaching Assistant

Computer Science & Engineering, University of Nevada, Reno — 2021–2024

- Supported ~40 students per semester in Embedded System Design Lab; assisted instruction, grading, and mentoring.
- Helped design lab materials and guided hardware/software integration projects.

Remote Research Mentor

Biomedical Engineering, Purdue University — 2022–2023

- Mentored students in mitochondria-focused gene expression and pathway analysis projects.

Lecturer

Computer Engineering, Azad University of Arak — 2017–2018

- Independently taught Introduction to Databases (SQL) to ~70 students; created lectures, assignments, and exams.

Teaching Assistant
Computer Engineering, IUST — 2015–2016

- Supported Data Mining course through grading and lab supervision.

AWRDS and HONORS

Best Graduate Student Researcher Award, University of Nevada, Reno — Spring 2025
Selected as the top graduate researcher across the university for exceptional contributions to computational biology, machine learning, and bioinformatics.

Outstanding Graduate Student Researcher Scholarship, University of Nevada, Reno — Spring 2025
Awarded a competitive merit-based scholarship recognizing innovative research and academic excellence.

Fully Funded Ph.D., University of Nevada, Reno — Aug 2021 – Present
Secured full financial support including tuition waiver and competitive stipend for doctoral studies, granted to outstanding applicants with demonstrated research potential.

Best Thesis Award, Department of Computer Science, IUST — 2017
Recognized for authoring the top master's thesis in the department, highlighting contributions to computational methods and system design.

Fully Funded Master's, IUST — Sep 2014–2017
Awarded full governmental support covering tuition and living expenses, granted to top-ranked students entering domestic graduate programs.

RELEVANT SKILLS

Languages:	R, Python, C++, C#, JavaScript
Bioinformatics / Statistical Analysis:	Bioconductor, DESeq2, edgeR, limma, ggplot2, WA, GATK, Samtools, Picard
Data Manipulation:	dplyr, tidyr, data.table, Numpy, Pandas, Matplotlib, Seaborn
Machine Learning:	TensorFlow, PyTorch, scikit-learn, (Academic Experience) Weka, Rapid Miner
AI Agents / Agentic Systems:	Agentic architectures, MCP tool integration, context & memory engineering (short-term/long-term), agent evaluation (logging, tracing, metrics), multi-agent deployment using A2A
Database:	SQL Server, MySQL
Software:	RStudio, Microsoft Visual Studio, VMWare, Android Studio, PyCharm
Version Control / Collaboration:	Git, GitHub, GitLab
HPC / Cloud:	AWS, Google Cloud